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execution his personal views, uninfluenced by the opinions of the scientific world.

FRANZ BOAS.

COLUMBIA UNIVERSITY,

November 8, 1902.

A CORRECTION OF PROFESSOR OSBORN'S NOTE ENTITLED 'NEW VERTEBRATES OF THE MID-CRETACEOUS.'*

ON page 675 of this article in speaking of *Ornithomimus* Professor Osborn says: 'Mr. Hatcher states that he found Marsh's type of this genus, consisting of a foot and portion of a limb, on Cow Island, Missouri River, at a level which he estimates from 1,500 to 1,600 feet below the summit of the Judith River beds, and 500 to 600 feet below the level of Marsh's type of *Ceratops montanus*.' I certainly did not mean to convey the impression that I had found the type of the genus, but rather of the two species, *O. tenuis* and *O. grandis*. The type of the genus is *O. velox* and it was found in Colorado. The types of the other two species are from Montana and were found as Professor Osborn has stated, except that they were not found on Cow Island but near the foot of the bluffs on the north bank of the Missouri River, opposite Cow Island and just below the mouth of Cow Creek. Since this same error occurs also in Professor Osborn's 'Distinctive Characters of the Mid-Cretaceous Fauna' (No. 1, Part 2, Vol. 3, Contr. to Can. Pal.), I have thought it best to make the above correction.

Again, on page 673 of Professor Osborn's note in SCIENCE he says: ' * * * the true Judith River beds certainly overlie the Ft. Pierre and are of more recent age.' I do not know upon what authority Professor Osborn makes this unqualified statement as to the deposits underlying the Judith River beds. It certainly does not agree with my own observations made during several weeks passed in collecting vertebrate fossils from these beds, nor with the published statements of Meek, Hayden and others, as will appear from the following: "They (the Judith River beds) appear, as near as could be ascertained, to occupy a local basin in a series of marine

deposits, consisting of beds of sandstone and impure lignite, which we have regarded provisionally as of the age of No. 1 of our general section. Lower down the Missouri, near the mouth of Little Rocky Mountain Creek, this last-mentioned series of rocks upon which the fresh-water deposits repose at the mouth of the Judith is clearly seen to pass beneath No. 4 (the Pierre shales) of the general section."* During my work in this region in 1888 and again in 1892 I nowhere saw the Pierre underlying the true Judith River beds, although at that time I believed it belonged beneath these beds, not then being familiar with the work of Dawson, Tyrrell and other Canadian geologists. I remember, however, to have noticed some 300 or 400 feet of shales very similar to the Pierre overlying the Judith River beds along the old Ft. Benton and Cow Island trail between the Bear Paw Mountains and Cow Creek, and I have little doubt but that these are the representatives of the Pierre shales in this region.

The fact that Cretaceous Nos. 2 and 3 are entirely wanting in this region leads to the inference that they are represented by the lower members of the Judith River beds, and that the lower members of these beds are in reality older than the oldest of the Belly River series, a little farther north. Owing to the scarcity and fragmentary nature of vertebrate fossils in the Judith River beds they have not received the attention from vertebrate paleontologists that they deserve and from several points of view no more fruitful field awaits the collector than these deposits. They need to be thoroughly explored for vertebrate and invertebrate fossils, and their somewhat complicated stratigraphy must be carefully worked out in detail before we shall be able to fix with any degree of certainty either their upper or their lower limits. Beds of fresh-water, brackish and marine origin are here known to be interstratified with the upper and lower limits of deposits usually referred to the Judith River beds, and I should not be at all surprised that within the region lying along the eastern base of the Rocky Moun-

* SCIENCE, N. S., Vol. XVI., October 24, 1902, pp. 673-676.

* Meek and Hayden, Proc. Phil. Acad. Sci., May, 1857, pp. 124-125.

tains and between the Saskatchewan River on the north and the Platte River on the south fresh-water representatives of the entire Upper Cretaceous series will yet be found. Both the terrestrial vertebrates and the fresh-water mollusca of the Belly River, Judith River and Laramie beds indicate that they and their ancestors found somewhere in this immediate region a congenial habitat where it was possible for them to continue their development without interruption. The Pierre shales in the Belly River region are remarkably thin as compared with the thickness to which they attain in the south, where the Belly River beds are wanting, thus indicating that in the former region the lower Pierre shales are replaced by the fresh-water deposits known as the Belly River beds.

Several years ago (*Am. Nat.*, February, 1896, p. 116) the present writer affirmed that the Judith River beds were *certainly older than the Ceratops beds of Converse County, Wyoming, and that the dinosaurs from the Judith River country belonged to smaller and less specialized forms than those from the latter locality.* It is gratifying to note that Professor Osborn has arrived at the same conclusion. In the article in the *American Naturalist* just cited I considered the Judith River beds as the equivalent of the 400 feet of barren sandstones lying between the base of the Ceratops beds and the marine Fox Hills sandstones in Converse County, Wyoming. I am at present of the opinion that they pertain to a still lower horizon.

J. B. HATCHER.

CARNEGIE MUSEUM,
October 27, 1902.

SHORTER ARTICLES.

A CASE OF MIMICRY OUTMIMICKED? CONCERNING KALLIMA BUTTERFLIES IN MUSEUMS.

IN a recent collection illustrating mimicry I noticed that the *Kallima* butterflies had been placed on twigs whose dried leaves were startlingly like the butterflies in their position of rest. There was no doubt that the butterflies were in exactly the right position for orthodox mimicry; the antennæ were carefully tucked out of sight, and the folded wings were in

the plane of the adjacent leaves; and certain leaves of the spray had, it seemed, opportunely fallen off so as to allow the insects to seize the vacated places with unerring accuracy, each crouching at such an angle that the tail processes of the hind wings fitted near the scar on the stem where the leaf had been attached. The leaves, moreover, which had been chosen to imitate the tropical butterflies happened to belong to a *North American* tree, and it is even possible that they had been skilfully touched up to mimic, one, the usual type of *Kallima*, with distinct rib-like markings, another, the form which seems fungus-spotted.

As a work of art this preparation was certainly a success, and it taught interested visitors a forceful lesson in animal economy. But I have to confess that it gave me the feeling that both insects and préparateur had overdone their work. And that the preparation had an additional air of false pretenses about it for which the naturalist afield more even than the préparateur and the hapless butterflies, is to blame. For he is the one who allows the finishing details in such cases of mimicry to be assumed without critical foundation. In the present case, indeed, one may justly query whether *Kallima* mimics its surroundings as perfectly as the préparateur will have us believe. Wallace himself, who knew the creatures at first hand, does not figure them as accurately adjusted to their surroundings as are these mounted specimens. And even his account seems to need amplification, *e. g.*, as to the species of leaf mimicked and the more exact habits of the butterflies.* And beyond this I do not recall detailed field observation. Perhaps I should say that my faith in the possibilities of *Kallima* became somewhat weakened during a visit to the

* Thus he states in his 'Malay Archipelago' (p. 142) that 'the habit of the species is *always* (italics mine) to rest on a twig and among dead or dry leaves,' but later admits (Natural Section, p. 44) that only 'on one or two occasions the insect was detected reposing * * *.' He does not show furthermore what the leaf is that is so exactly mimicked, merely referring to general resemblance to 'the leaves of many tropical leaves and shrubs.'